AM-1
EOC COMPATIBILITY TEST 2
(ECT2)
WORK PLAN

May, 1997

Contents

Exhibits

CHANGE HISTORY

Date	Description
24 March	Initial draft being tracked in change history
6 May	Added material to Section 2 to address: • Success Criteria • Data Recording and Analysis • Discrepancy Reporting Added Command Validation Test to Work Break down structure
13 May	Specific responsibilities: • ECT2 Test Director - from Iona to Max • AM1 Liaison - from Chang to Kozon • FOT Lead - from Jones to McKenzie

1. Purpose

The purpose of this work plan is to define roles and responsibilities, identify work items, and establish a management routine to complete the second AM-1 to EOC Compatibility Test (ECT2) in July of 1997.

2. ECT2 Test Team

2.1 Roles and Responsibilities

The ECT2 Test Team will be lead by the ESDIS System Integration and Test (SI&T-GSFC 505) supported by the organizations and individuals listed in Exhibit 1 below.

Organization and Representatives	Responsibilities
ESDIS SI&T (GSFC 505) Michael Max Phil Parker	• EGS Test Director - overall coordination of preparations and direction of execution in the EGS. • Coordinate and schedule institutional support • Translate LM recommended / required operational sequence into test timeline. • Produce top level script • Produce Test Reports
LMMS-VF I&T LMMS-VF FOE Gene Keeling	• AM-1 Spacecraft Test Director - VEHICLE SAFETY! • Enumeration of S/C capabilities and restrictions for test • S/C test preparations • S/C I&T procedures to support test preparations and test timeline
AM-1 Project Bob Kozon	• Provide technical review of ECT2 preparations from the AM-1 project perspective. • Local GSFC liaison to Lockheed Martin spacecraft contractor at VFPA
ESDIS EOC (GSFC 510) Dennis Small	• Technical review of ECT2 preparations from the EOC perspective • Liaison to Lockheed Martin (EOC Development) to insure EOC development will support ECT2 • EOC Facility and System Readiness to support ECT2
EDOS Project (GSFC 510) Bonnie Seaton	• Technical review of ECT2 preparations from the EDOS perspective. • EDOS Facility and System Readiness to support ECT2
AM-1 Flight Operations (Lockheed Martin - AM-1 Flight Operations) Bob Kozon Ken McKenzie	• Produce ECL procedures to support the test timeline • Provide FOT Test Director during test • Provide EOC Operators during test • Submit Nascom briefing message (if required)

EXHIBIT 1: ECT2 Test Team Roles and Responsibilities

Organization and Representatives	Responsibilities
EBnet (GSFC 540) Chris Garman Paul Sullivan	• Technical review of ECT2 preparations from an EBnet perspective. • Liaison with EDOS, EOC, and SCS to ensure connectivity to support ECT2. • EBnet operations and maintenance support to ECT2.
Space Networks (GSFC 530) Dave Davies	• Technical review of ECT2 preparations from the Space Networks perspective • Preparation of TDRSS configuration codes to supportECT2 • Scheduling of SN services to support ECT2.
ECS / FOS Development Debbie Dunn Carol Cachulski	• Review EOC procedures to verify correctness and the ability of FOS Release A to support ECT2. • Developer support in the EOC for EOC procedure dry runs and ECT2 execution.
ECS / FOS I&T (HITS) Greg Dvornicky	• EOC technical expertise • Script and procedure review
EGS I&T / ETS (GSFC 505 /CNMOS) Henry Zaveleta	• ETS expertise - prepare test data for dry runs with ETS • ETS Operations during ECT2 dry runs

EXHIBIT 1:(cont.) ECT2 Test Team Roles and Responsibilities

2.2 Test Management

2.2.1 Routine

The ECT2 Test Team will meet on a regular basis set by the EGS Test Director. The EGS Test Director will chair these meetings. Team members will report status of preparations; issues and problems will be reported and actions will be assigned for resolution.

Comments on the ECT2 Test Package may be submitted to Phil Parker at any time via e-mail (pkp@gblt.inmet.com) or by phone (301-982-5414 or 301-982-1059 ext 255).

Comments of the ECT2 preparation schedule may be submitted to Hillary Shein at any time via e-mail hss@gblt.inmet.com) or by phone (301-982-5414 or 301-982-1059 ext 321)

2.2.2 Test Execution

ECT2 will be executed in accordance with the following ground rules:

- The priorities for ECT2 are:

    (1) AM-1 spacecraft safety
    (2) Attainment of ECT2 objectives listed in the test package
    (3) Opportunity testing to gather such data as may be useful to either EOC or AM-1 engineers to insure flight system - ground system compatibility and mission success.

- Technical prerequisites for ECT2 will be established in the ECT2 test package. ECT2 will not be executed until these prerequisites have been met.
- The Spacecraft Test Director in charge at the S/C I&T Facility has the authority to stop the test at any time if spacecraft safety is in question.
- The EGS, FOT, and Spacecraft Test Directors may, after consultation and mutual agreement, deviate from the procedures as necessary to respond to unanticipated problems, test procedure errors, or opportunities to collect data of interest to flight and ground system developers without compromising vehicle safety. All such deviations will be reported in the ECT2 test report.
- On the net briefings and de-briefings will be held before and after test execution. The EGS I&T Contractor will produce a “quick look” test report within 48 hours of test completion and the final ECT2 test report within 2 weeks of test completion.

Lines of authority and concurrence for ECT2 are shown in Exhibit 2.

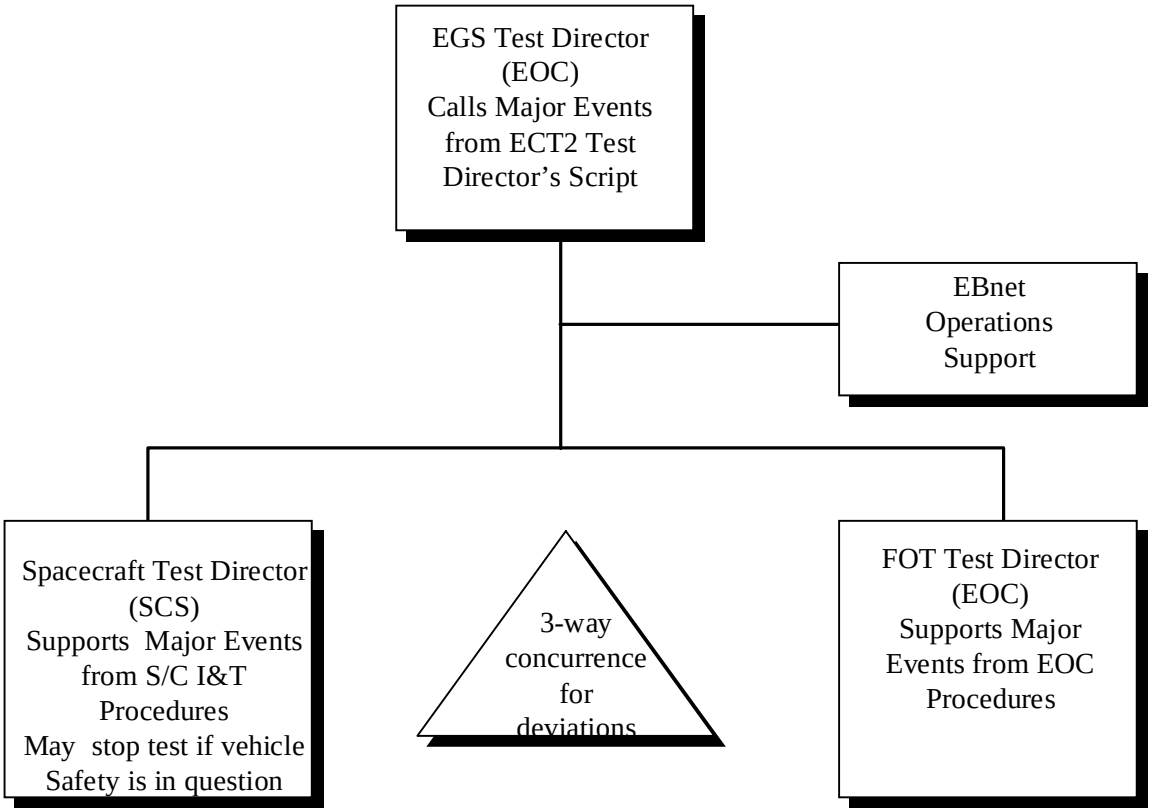

EXHIBIT 2: ECT2 Execution lines of authority

Data Recording and Analysis:

The following data will be logged and made available for Post-test analysis:

EOC data:

Command and Telemetry Console logs
Command event messages
Telemetry page snaps
Command Data Base hex dumps
Telemetry archive files
Events archive .files.

Spacecraft I&T data:

I&T ECT2 Command Log
I&T ECT2 Command Filter Log (for hardline activities via the SCS)

EDOS Data:

EDOS Forward Link Log Files
EDOS Data Capture Log files
EDOS Housekeeping Telemetry Log files
EDOS Health and Safety Telemetry Log files

Space Network Data:

Line Outage Recorder data

Success Criteria: Success for ECT2 will be evaluated in terms of the objectives set forth in the test package being met. Each objective is stated as an overall objective supported by specific capabilities. For example:

- Verify that the EGS can receive and process all telemetry rates received through the SN.

1. Receive and process 16 kbps Housekeeping telemetry on the I and Q channels (TDRSS SSA service)
2. Receive and process 1 kbps Health and Safety telemetry on the I and Q channels, to include CTIU telemetry points. (TDRSS SSA service)
3. Receive and process SCC diagnostic dumps at 16 kbps on the Q channel (While receiving 16 kbps HK data on the I channel) (TDRSS SSA service)
4. Receive and process SCC diagnostic dumps at 1 kbps on the Q channel (While receiving 1 kbps H&S data on the I channel) (TDRSS SSA service)
5. Provide full telemetry data accountability at both the VCDU and packet level
6. Demonstrate proper processing and display of derived parameters.
7. Properly display both EU converted and raw data values

This objective will be considered to have been met if all 7 supporting functions were exercised with no Discrepancy Reports of priority 1 or 2 written against them. The ECT2 Test Report will identify objectives met, objectives not met, and priority 1 and 2 discrepancy reports mapped to unsatisfied objectives

2.3 Test Documentation

The following documents, in addition to this work plan, will be produced to support ECT2:

ECT2 Test Package (WBS 3.8.2)
ECT2 Flight Operations Team Procedures (WBS 3.3.2)
AM1 Spacecraft I&T Procedures for ECT2 (WBS 3.1.4)
ECT2 Test Report (WBS 3.8.3)
ESDIS Systems Management Office (SMO) Discrepancy Reports

Additionally, a network briefing message and debriefing message will be produced for ECT2.

The ECT2 Test Package (WBS 3.8.2) is the controlling procedure used by the EGS Test Director to guide the overall execution of the test. It provides major execution steps and points to the corresponding sections of the Spacecraft I&T procedures and Flight Operations Team procedures for details. The format and content of ECT2 Test Package is given below:

Background Information

Test Objectives - Primary and Secondary Objectives prioritized and sufficiently detailed to support timeline generation.

Test Configuration - Block diagrams showing data flow paths at a high level and at detailed levels at Valley Forge and within the EOC, identification of software configuration for EDOS and ECS software in the EOC.

Participants and Support Requirements - Identifies test participants, voice and data communications circuit designations, Equipment and Software requirements, test tools, and provides a test data description.

Test Timeline - the major events for the test, showing the configuration of the forward and return links for each event.

Test Director's Script - the top level procedure followed by the EGS Test Director, supporting the test timeline and referencing detailed Spacecraft I&T and Flight Operations Team procedures.

The Spacecraft I&T Procedures (WBS 3.1.4) will be developed by LMMS - VF I&T and will consist of the necessary OASIS command language procedures and detailed Spacecraft Checkout Station operating procedures to support the events on the test timeline.

The Flight Operations Team Test Procedures (WBS 3.2.2) will be developed LMSMS FOT and will consist of the necessary EOC Command Language (ECL) procedures and detailed EOC operating procedures to support the events on the test timeline.

The **ECT2 Final Test Report** (WBS 3.8.3) will be produced by the EGS I&T contractor within 30 days of test completion. The format and content for the final test report is given below:

Executive Summary - a brief summary evaluation of the test and implications for the execution of the ECT3, the next test in the series.

1. Narrative Report - a brief narrative of the test activities, highlighting major events.

2. Deviations and Work-arounds - any deviations from the ECT2 procedures and the reasons for those deviations and any work-arounds employed.

3. Problems encountered - a list of hardware and software anomalies encountered, corrective action taken, and problem reports submitted, where necessary.

4. Lessons Learned - lessons learned concerning test planning and execution, and flight and ground system operations to be carried forward to ECT3 for process improvement.

Appendix A: Test Data Package - A listing of supporting data (command and telemetry logs, event logs. Archive files, etc.) held by the various participants and available for review or analysis as needed.

Appendix B: Discrepancy, Problem and Non-conformance Reports - A listing of the various problem reports submitted by the participants

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Discrepancy Reporting:

Problems encountered during preparation for ECT2 and ECT2 itself will be documented as follows:

Flight Operations Segment	FOS developers Non Conformance Reporting (NCR) system.
Spacecraft I&T (Spacecraft and I&T facilities)	Spacecraft I&T Problem Report System.
Space Network	Space Network NCC Problem Report System.
EDOS and EBnet	ESDIS Systems Management Office (SMO) Discrepancy Reporting System.

Problems occurring during ECT2 execution will be listed with the corresponding problem report number in the ECT2 test report.

3. Work Breakdown Structure

3.1 Spacecraft Preparations [Lockheed-Martin - LMMS-VF]

Spacecraft preparations will be conducted in accordance with detailed I&T procedures under the direction of LM/VFPA. Items listed here are major events of interest to all participants.

3.1.1 Spacecraft Capabilities and Limitations Conference

LM/VFPA will brief the ECT2 team on the capabilities and limitations of the AM-1 spacecraft in the ECT2 time frame and provide a recommended operational sequence of events for ECT2. This briefing will include identification of prohibited and allowed commands for ECT2 and the identification of any other operational constraints on the test.

3.1.2 Bus / Spacecraft Integration

Bus spacecraft integration activities to be completed before ECT1 are:

Install EAS/SMS HW
Install Equipment Modules
Flight Software Interface test
S/C bus functional test
Install CPHTS (depending on what instrument activities are approved for ECT2)

3.1.3 Instrument Integration and electrical systems check-out

Instrument Integration and electrical systems check-out activities to be completed prior to ECT2 are:

Instrument installation
Spacecraft functional test
SN engineering tests and data flows

3.1.4 Develop ECT2 S/C I&T Facility Console Procedures

LM/VFPA will develop and check out S/C I&T Facility console procedures for ECT2.

3.1.5 Command File Validation Test

LM/VFPA, supported by the FOS developer and the FOT, will lead the command file validation test as described in the Proposed PDB Command File Validation Plan (T. Svoboda memo of 18 April 97)

3.2 Flight Operations Segment (FOS) Preparations [LM/ECS Contract]

3.2.1 FOS ECT2 Capabilities Development

The FOS Developer will develop, integrate, and test FOS hardware and software to support the following capabilities:

1. Full telemetry archiving capability

2. Forward Link configuration and control to include PLOP1, PLOP2, COP1 protocols and full FARM and FOP directives.
3. Hazardous command processing
4. Memory Dump control processes to include implementation of the IMGCMP, IMGOVER, IMGRPT ECL directives.
5. Memory load capability

3.2.2 EOC Performance Demonstration

The FOS developer will demonstrate that the FOS can perform the functions required for ECT2 at operationally acceptable speeds. This may be done in conjunction with Engineering Tests or Dry Runs.

3.2.3 PDB Validation

The FOS developer will validate the PDB version selected for ECT2.

3.3 Flight Operations Preparations [AM-1 Flight Operations Team]

3.3.1 EOC Configuration Definition

LM/FOT will identify primary and backup processing strings (logical strings) for ECT2.

3.3.2 ECT2 Flight Operations Team Procedures

LM/FOT will develop ECL procedures and other detailed console procedures to support the test time-line

3.4 EDOS Preparations [GSFC 510/TRW]

3.4.1 EDOS V3 Development

The EDOS Developer will develop, integrate and test EDOS V3 capabilities at both the GSIF and LZPF, to culminate with the V3 demonstration.

3.5 EBnet Preparations [GSFC 540 / BAH]

3.5.1 ECT1 Problem Corrections

EBnet will troubleshoot, correct and test the following problems from ECT1:

Inability to support 125 bps commands
Duplicate Command Data Blocks (Multi-cast packets) on EOC - EDOS circuits
Unable to lock up on commands at the SCS
garbage between Command Data Blocks
clock instability

3.5.2 EBnet Connections to the White Sands Complex (WSC)

EBnet will install and test EBnet connections to the Space Network White Sands Complex.

3.6 Space Network Preparations [GSFC 530/ATSC]

3.6.1 Configuration Code Development

The SN will identify all TDRSS configuration codes needed to support ECT2 and enter them in the NCC data base.

3.7 ETS Support [GSFC 513/CNMOS]

3.7.1 ETS NCR Resolution

The ETS developer will conduct a review and disposition meeting for the ETS NCRs with the ECT2 team. The product will be an ETS NCR resolution plan agreed to by the ECT2 team.

3.8 EGS Test Director Support [EGS I&T Contractor]

3.8.1 Test Timeline Generation

From the recommended operational sequence provided by LM/VFPA, the EGS I&T contractor will generate a timeline for ECT2 identifying major events to occur at the EOC and the S/C I&T Facility. This timeline will be included in the ECT2 Test Package.

3.8.2 ECT2 Test Package Generation

The EGS I&T Contractor will develop the ECT2 Test Package, including the top level ECT2 Test Director's Script.

3.8.3 ECT2 Test Reports

The EGS I&T Contractor will produce a "quick look" ECT2 Test Report (Debriefing Message) within 48 hours of ECT2 completion and a final report within 30 days of completion.

3.9 Engineering Tests [ECT2 Team]

3.9.1 WSC - EDOS Engineering Test

EBnet and EDOS will establish forward and return link connectivity over EBnet between the WSC and EDOS.

3.9.2 AM1 I&T Facility - SN Engineering Tests

AM1 I&T, EBnet, GSFC 513, and the SN will conduct engineering tests as required to establish AM1 - SN R/F connectivity and compatibility for ECT2.

3.9.3 EOC - EDOS V3 - ETS Engineering Tests

EBnet, EDOS, and the FOS and ETS developers will conduct engineering tests as required to establish forward and return link connectivity between the EOC, EDOS V3, and the ETS.

3.10 Dry Runs [ECT2 Team]

3.10.1 Dry Run 1: EOC - EDOS - MPS (in spacecraft mode)

FOT Procedures will be dry run against the MPS in spacecraft mode with the MPS in Building 32. This may also be performed with the MPS in EDOS mode if EDOS is unavailable and ETS can support EDOS mode.

3.10.2 Dry Run 2: EOC - EDOS - WSC - MPS (in spacecraft mode at WSC)

FOT Procedures will be dry run against the MPS in spacecraft mode with the MPS at the WSC.

3.10.3 Dry Run 3: EOC - EDOS - SCS - S/C SIM via EBnet hardline

FOT and Spacecraft I&T procedures will be run against the spacecraft simulator via the EBnet hardline connections.

4. Work Flow and Schedule

ECT2 WBS items will be dependency networked and scheduled using MicroSoft Project in a separately provided document.